EROSION AND SEDIMENTATION
DOWNSTREAM FROM
HARRY S. TRUMAN DAM
AS A RESULT OF
HYDROPOWER OPERATIONS

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8. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

A summary of the results of the field sampling, laboratory testing, analysis, and mathematical model simulations is presented in this section. Based on these results, the five specific study objectives listed in the introduction are addressed. Finally, specific recommendations are made.

8.1 Summary

In order to accomplish the objectives of this study, it was first necessary to determine the resistance of the sediment material on the bed and banks of the Lake of the Ozarks under ambient conditions that were likely to occur in the system. Accordingly, borings were made at over a hundred locations to obtain samples for visual classification and laboratory testing. The sampling locations were distributed throughout the Lake of the Ozarks but concentrated in the headwater area (first 30 miles downstream of HST) where impacts due to power generation and pumpback would be most intense.

The laboratory testing program was so designed as to provide an adequate description of the erodibility characteristics of the bottom sediments and bank material. It was planned to test as many samples as necessary to describe spatial variation of properties. Since the erodibility of soil depends on the chemical constituents of the eroding waters, a program to measure the salt concentration and type of salts in the waters of the Osage river was instituted in February 1979. It was found that the total salts and type of salts in the river water showed very little seasonal variation. This is an important factor in determining the resistance of the clayey bed and banks to erosion since the resistance of a soil to erosion increases markedly with increase in salt concentration in the eroding waters. Furthermore, the erodibility tests on the undisturbed samples showed that the firm bed and bank material was highly resistant to erosion by even distilled water. This material will not erode under the action of the flows that will result from power generation operations since the shear stresses generated by such flows will be much smaller than that required to cause scour. The erodibility tests showed that there was no problem of catastrophic erosion of the bed and the banks of the Lake of the Ozarks downstream of Truman Dam.

However, the testing apparatus only permits the use of samples that are stiff enough to be trimmed into cylinders and stand on their own. Observations showed the presence of a fluffy soft deposit of clay sediment 2-6 inches thick on the bottom of the Lake in most areas. In addition, some of the samples were so fractured that they broke up into chunks and therefore, could not be tested in the apparatus for erodibility. Nevertheless, a sufficient number of samples were successfully tested to determine the erodibility of the deposits. In order to estimate the resistance of the soft deposit on the top of the bed and the samples that fractured, other physical and chemical measurements were made. Based on these measurements and empirical relationships obtained from previous studies on many soils and sediments, estimates were made of the erodibility of the material that could not be tested directly. The measured erodibility characteristics, and estimates where testing was not possible, were part of the input to the sediment transport model.

The object of simulating sediment transport using the model at this point was to determine the suspended sediment concentration levels that would result from the scour of the soft material on the bed and the time that it would take to clear out the erodible material. A number of sediment transport model runs were made with various discharge conditions from Truman Dam. The first set of runs were for constant releases of 27000 to 54000 cfs. The second set was for generation/pumpback at maximum capacity for one week with various Lake of the Ozarks pool elevations. These runs were made with the same starting bed condition, i.e., with the soft material present at the bottom of the Lake of the Ozarks. An additional run was made to determine the suspended sediment concentrations that would result during a weeks operation with no soft material at the bottom of the lake. This would represent conditions that would exist after removal of the soft material by flood control releases or previous power cycles. The suspended sediment concentrations and bed change that would occur for these flows are shown graphically in the previous chapter.

8.2 Conclusions

8.2.1 Bank Erosion. Bank stability analyses by Corps personnel showed that there was only one location of marginal instability. This location is on the left bank at river mile 89.9. Should failure occur at this site, localized sliding over a period of time may result in a maximum of 8500 cubic yards of material being involved.

Silt and fine sand are present as shallow overbank deposits on the left bank about 7000 feet downstream from the Middle Bridge, about 2000 feet downstream of the Highway 7 bridge, and on the right bank beginning 800 feet upstream from Highway 7 bridge and continuing downstream to the tip of the island. It is likely that shallow sloughing of this material would occur under high flow conditions and rapid drawdown. The volume of sediment involved will be small and is not expected to alter the suspended sediment concentrations significantly.

The bank opposite the new outlet channel confluence is composed of stiff clay overlain by 1-2 feet of topsoil. Although this bank can resist uniform flow past it at the highest discharges of power operations, the direct impingement of highly turbulent flow from the power house can cause instantaneous stress peaks that may dislodge bank material in this area. Minor erosion of this bank has already occurred and is being monitored by the Corps. Should this bank cut back to the dolomite bluff it may deflect the flow toward the right bank abutment of the new Highway 7 bridge immediately downstream.